UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,897	10/27/2000	Matthew S. Cooper	H0001190(4016)	7249

7590 07/30/2003

Shannon Morris
Honeywell International Inc
P O Box 2245
101 Columbia Road
Morristown, NJ 07962

EXAMINER	
MCDONALD, RODNEY GLENN	
ART UNIT	PAPER NUMBER
1753	13

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

bh

Office Action Summary	Application No.	Applicant(s)	
	09/699,897	COOPER, MATTHEW S.	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on th cover sheet with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12 May 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 28-43 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 28-43 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 28-43 are rejected under 35 U.S.C. 102(e) as being anticipated by Abburi et al. (U.S. Pat. 6,086,725).

Abburi et al. teach improved targets for use in DC magnetron sputtering of ***nickel*** or like ferromagnetic face-centered cubic (FCC) metals are disclosed for forming metallization films having effective edge-to-edge deposition uniformity of 5%(3) or better. Such targets may be characterized as having: (a) a homogeneous texture mix that is ***at least 20% of a <200> texture content*** and less than 50% of a <111> texture

content, (b) ***an initial pass-through flux factor (% PTF) of about 30% or greater***; and © ***a homogeneous grain size of about 200 μm or less.*** (See Abstract)

Such improvement in target longevity and/or deposition uniformity may be obtained first by providing, in ferromagnetic targets that have a thickness of as much as 3 mm or more: an average (with per-sample point restrictions), and more preferably, a ***homogeneous crystalline texture mix that is at least 20% of the <200> oriented texture.*** More preferably, the texture mix should at the same time be less than about 50% of the <111> oriented texture. Even more preferably, an average, and more preferably, ***a homogeneous texture mix should be provided that is at least 32% <200> texture***, while further keeping at less than about 10% the <111> oriented texture. Yet more preferably, an average, and more preferably, ***a homogeneous texture mix should be provided that is at least 35% <200> texture***, while further (optionally) keeping at less than 9% the <111> oriented texture. ***Yet more preferably, the latter homogeneous texture mix should further keep at less than 30% the <111> oriented texture. The remainder of the homogeneous texture mix can be of the <220> texture.*** (Column 2 lines 44-62)

A ***grain size of about 150 μm or less should be provided. Even more preferably, a grain size of about 100 μm or less should be provided.*** (Column 3 lines 48-50)

It is known in the art that target attributes can vary as a function of: (1) the mine or other source from which metal ore is obtained; (2) the purification process used for purifying the metal ore (into high purity nickel); (3) the casting process used for melting

and ***recrystallizing*** the purified metal; (4) the forging or metal working processes used for shaping the cast metal: (5) the machining processes used for giving each target its final shape; and (6) ***any annealing or other treatments applied to the target material during manufacture of the target.*** As such, the specific identities of companies A, B and C is irrelevant because ***alternative, target manufacturing processes may be used to create targets in accordance with specifications of the present invention.*** Company D is identified herein simply to demonstrate at least one such company that may create targets in accordance with specifications set forth herein. (Column 12 lines 3-19)

Claims 29 and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Cole et al. (WO 99/10548).

Cole et al. teach a high purity cobalt sputter target is disclosed ***which contains a face centered cubic (fcc) phase and a hexagonal close packed (hcp) phase***, wherein the value of the ratio of X-ray diffraction peak intensity, I_{fcc} (200)/I_{hcp} (1011), is smaller than the value of the same ratio in a high purity cobalt material obtained by cooling fcc cobalt to room temperature from the high temperature at which it is molten. High purity cobalt is defined as having an oxygen content of not more than 500 ppm, a Ni content of not more than 200 ppm, contents of Fe, Al and Cr of not more than 50 ppm each, and Na and K of less than 0.5 ppm. ***The disclosed sputter target is manufactured by subjecting the material to cold-working treatments (less than 422 C.). Annealing the material, at a temperature in the range 300-422 C for several hours, between cold working treatments significantly increases the***

amount of cold work which could be imparted into the material. The high purity cobalt is deformed in such a way so as to cause the (0002) hcp plane to be tilted between 10-35 from the target normal. The aforementioned phase proportions and crystallographic texture significantly improves the sputtering efficiency and material utilization. (See Abstract)

In the case of high purity cobalt, the ratio of fcc phase to hcp phase has significant influence on the magnitude of the magnetic permeability. The fcc phase is much less anisotropic in magnetic properties than the hcp phase. Consequently, a target consisting mostly fcc phase has very low PTF, and since there are no strongly preferred crystallographic directions the flux flow is dictated by the target geometry. This geometry tends to restrain the flux within the plane of the target and inhibits flux leakage. If the amount of hcp phase in the target is increased and the easy magnetization direction <0001> in the hcp crystal is aligned normal to the target surface, the permeability in the plane of the target is decreased, and it is easier to generate the leakage magnetic field through the thickness of the target. If it were possible to decrease the fcc phase in the cobalt sputter target manufactured by the conventional process, and to increase its hcp phase so that the ratio of the fcc phase to the hcp phase is decreased, then the permeability in the plane of the target could be decreased, resulting in an increase in the magnetic leakage field on the surface of the target. This means that a high purity cobalt target which is thicker than the conventional cobalt can be used, resulting in longer service life and improved material utilization. (Page 3 lines 7-20)

It is difficult in practice to obtain the ratio off cc phase to hcp phase of cobalt by optical volume measurement. It has become common in the industry to consider a ratio of the intensity of X-ray diffraction peaks which are proportional to the volumetric ratio of the two phases. The peaks which are used in the ratio are the (200) in the fcc phase and the (10 11) peak in the hcp phase. These peaks were chosen because of overlap in the stronger fcc (111) and hcp (0002) diffraction peaks. (Page 3 lines 21-26)

The inventors have developed a process for manufacturing high purity cobalt sputter targets which is characterized by a ratio of the X-ray diffraction peak intensity for the fcc phase to the X-ray diffraction peak intensity for the hcp phase, which is considerably smaller than in the conventionally processed high purity cobalt sputter target. The process of this invention comprises the steps of heating conventional high purity cobalt material having a fcc single phase until it is melted, and then pouring it into a mold and allowing it to cool from the high temperature. This step can be carried out by any available melting means. However, it is preferable to use a vacuum casting method, such as a vacuum induction melting furnace, or an e-beam furnace. The resultant cast ingot is then cooled to room temperature. In the alternative, the ingot is subjected to a hot-working treatment. The ingot is then allowed to cool to room temperature, so that part of the fcc single phase is transformed into a martensite structure comprising a hcp phase. Then, in the second stage of the process of this invention, the resultant cobalt material comprising mostly a fcc phase with some hcp phase is subjected to a cold-working treatment, which preferably results in a thickness reduction of no less than 5% at a temperature less than the hcp transformation temperature (422 C.). ***As a***

result of the cold working, a compression strain is imparted to the cobalt material and a part of the existing fcc phase is transformed into a martensite structure comprising a hcp phase. (Page 3 lines 27-29; Page 4 lines 1-14)

Any of the conventional cold-rolling methods, such as rolling, drawing, swaging, forging or general press working may be used for this invention. It is preferable that the high purity cobalt is cold worked until its reduction in thickness is about 10% or more. To increase the reduction, the inventors found that intermediate anneals in the temperature range 300-422 C for several hours allowed substantially more (40-60%) cold work to be imparted into the cobalt. Without such intermediate anneals, the cold ductility limit was found to be 20-25%. High purity cobalt manufactured in the aforementioned way can produce a significantly smaller X-ray diffraction beak intensity ratio, I_{fcc} (200)I_{hcp} (1011), compared to conventionally processed high purity cobalt. The inventors observed that in high purity cobalt which has received about 10% or greater cold deformation, there was no detectable fcc phase present in the material, in which case the intensity ratio, I_{fcc} (200)/I_{hcp}(1011), becomes about zero. (Page 4 lines 15-25)

Intermediate anneals in the range 300-422.degree. C. were used to ***stress relieve*** (i.e. cold working will produce stress) and ***recrystallize*** the cobalt and allow additional cold working treatments to proceed without the material exceeding the ductility limit and fracturing. This intermediate annealing step is an integral part of the invention and allows substantial quantities of cold work to be imparted into the metal, and in so doing significantly reduces the amount of fcc cobalt in the final material. Table

1 shows the composition of the seven high purity cobalt samples used to illustrate invention. (Page 5 lines 14-19)

The strength of the magnetic field leaked into the discharge space can be measured by PTF. FIG. 4 shows the PTF measurements associated with a conventional cobalt sputtering target (a) and a cobalt sputtering target according to this invention (b). (Page 6 line 16-19)

The results, shown in Table 2, confirmed that the permeability in the plane of the conventional sample is multiples higher than it is in the samples of this invention. The permeability ratio, (z-direction/x-direction) is significantly increased with cold work treatment according to this invention. (Page 6 lines 20-23)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 28-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abburi et al. (U.S. Pat. 6,086,725).

Abburi et al. is discussed above and all is as applies above. (See Abburi et al. discussed above)

The differences between Abburi et al. and the present claims is that the exact steps to achieve the claimed product is not disclosed, the exact range of texture is not

discussed, selected boundary ranges is not discussed and the exact range of grain size is not discussed.

As to the exact steps required by the claims in order to achieve the *claimed product*, it is pointed out that Abburi et al. teach that various alternative manufacturing processes can be utilized to achieve their required product and that their required product meets the product limitations required by Applicant's claims. (See Abburi et al. Column 12 lines 12-15)

As to the exact range of texture required by Applicant's claims, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the portion of the prior art's range which is in the range of applicant's claims because it has been held to be obvious to select a value in a known range by optimization for the best results, see In re Aller, et al., 105 U.S.P.Q. 233.

As to the boundary range required by Applicant's claims, it is believed that the target would inherently have a boundary range encompassing a test area where the fcc phase is present. (See Abstract)

As to the exact range of grain size required by Applicant's claims, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the portion of the prior art's range which is in the range of applicant's claims because it has been held to be obvious to select a value in a known range by optimization for the best results, see In re Aller, et al., 105 U.S.P.Q. 233.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made have a target with specific properties as taught by Abburi et al. because it allows for increasing the pass through of a magnetic field.

Claims 29 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al. (WO 99/10548).

Cole et al. is discussed above and all is as applies above. (See Cole et al. discussed above)

The differences between Cole et al. and the present claims is that inducing stress is not directly discussed and the specific reduction in cross-sectional area is not discussed.

Cole et al. teach that the cold working treatments induce stress to the target and heat treatments are needed to reduce some of the stress in order to do additional cold working steps which induce stress. (See Cole et al. Column 4 lines 11-17)

As to the specific reduction in cross-sectional area, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the portion of the prior art's range (i.e. at least a reduction in thickness of about 10% or more) which is in the range of applicant's claims because it has been held to be obvious to select a value in a known range by optimization for the best results, see In re Aller, et al., 105 U.S.P.Q. 233.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a target with specific properties as taught by Cole

et al. because it allows for increased permeability ratio, sputtering efficiency and material utilization.

Response to Arguments

Applicant's arguments filed 5-12-03 have been fully considered but they are not persuasive.

In response to the argument that Abburi et al. fail to teach that an amount of induced stress in a PVD component sufficient to increase magnetic pass through in comparison to the flux exhibited by the PVD component without the induced stress, it is argued that the working steps in order to achieve the an increased <200> orientation in the invention of Abburi et al. would inherently induce stress in the grains. It is agreed that Abburi et al. recognize that there is in fact work induced strain in the targets and that it would be helpful to reduce the strain the target. However Abburi et al. use of the word "helpful" indicates that it could be an optional step. What is important to Abburi et al. is increasing the <200> orientation in order to increase the magnetic flux pass through which is what Applicant desires. (See Aburi et al. discussed above)

In response to the argument that Abburi et al. fail to teach a sputter component possessing the structure and advantages of the claimed sputter component that is unidirectionally cold worked to at least about 80% in cross-sectional area, it is argued that the cold working step claims is a process limitation and has little weigth when considering the product limitations. The product requires a sputter with a high pass through flux which is what Abburi et al. teach. (See Abburi et al. discussed above)

In response to the argument that Cole et al. do not teach a cobalt target that consists essentially of a fcc crystalline structure, it is agreed that Cole et al. does not teach a target consisting essentially of a fcc crystalline structure.

In response to the argument that Cole et al. do not teach unidirectional cold working with heat treatment, it is argued that Cole teach a target with high pass through flux. The process limitations are given little weight when considering the product claims. The product can be made by Cole et al. with a high pass through flux. (See Cole et al. discussed above)

The WIPO version of Cole et al. has been cited. It qualifies as prior art under 35 U.S.C. 102(b).

This acton is made NON-Final based on the newly cited reference to Cole et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9310 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
July 16, 2003